What is claimed is:

1. An optical-element mounting for holding an optical element relative to an optical column of an optical system that includes the optical element, the optical element having a mounting surface, the mounting comprising:

multiple holding devices arranged at respective locations relative to the mounting surface, each holding device comprising a respective linking unit extending from a respective location on the optical column to a respective bonding member attached to a respective bonding location on the mounting surface;

each bonding member comprising a bonding pad bonded to the respective bonding location on the mounting surface, and at least first and second spring members extending from the bonding pad in respective directions to the linking unit.

2. The mounting of claim 1, wherein the mounting surface is a peripheral side surface of the optical element.

3. The mounting of claim 1, wherein the first and second spring members extend in opposite directions from the bonding pad.

4. The mounting of claim 3, wherein the first and second spring members extend in opposite directions from the bonding pad along a line parallel to a tangent line at the bonding location.

5. The mounting of claim 1, wherein each spring member comprises a respective rigid portion flanked by respective flat springs, the flat springs and rigid portion serially extending in the respective direction from the respective bonding pad to the respective linking unit.

6. The mounting of claim 1, wherein:

each bonding pad has a segmented bonding surface: and

the segmented bonding surface is bonded to the respective bonding location on the mounting surface of the optical element.

7. The mounting of claim 1, wherein each bonding member further comprises third and fourth spring members extending from the bonding pad in respective directions to the respective linking unit.

8. The mounting of claim 7, wherein the third and fourth spring members extend from the bonding pad in respective directions along a line parallel to an axis of the optical element, to the respective linking unit.

9. The mounting of claim 7, wherein each spring member comprises a respective rigid portion flanked by respective flat springs, the flat springs and rigid portion serially extending in the respective direction from the respective bonding pad to the respective linking unit.

10. The mounting of claim 9, wherein:

each bonding pad has a segmented bonding surface: and

the segmented bonding surface is bonded to the respective bonding location on the mounting surface of the optical element.

11. The mounting of claim 10, wherein the bonding surface of each bonding pad is segmented by a series of intersecting grooves defined in the bonding surface.

12. The mounting of claim 1, comprising at least three holding devices arranged at respective equi-angular locations relative to the mounting surface.

13. The mounting of claim 1, further comprising a mounting member attached to the optical column, wherein the holding devices are attached to respective locations on the mounting member.

14. The mounting of claim 13, comprising at least three holding devices arranged at respective equi-angular locations on the mounting member relative to the mounting surface.

15. The mounting of claim 12, further comprising a mounting flange coupling the mounting member to the optical column.

16. The mounting of claim 13, wherein the mounting flange has a thickness of no greater than 1/10 a thickness of the mounting member.

17. The mounting of claim 16, further comprising a spacer interposed between the optical column and the mounting flange.

18. The mounting of claim 1, wherein, with respect to each holding device, the respective spring members of the bonding member are attached to the respective linking unit such that a gap is defined between the bonding member and the linking unit, thereby providing a configuration in which the bonding pad is suspended by the respective spring members relative to the linking unit.

19. An optical-element mounting for holding an optical element relative to an optical column of an optical system that includes the optical element, the optical element having an axis, a periphery, and multiple discrete mounting protrusions extending from respective locations on the periphery, the mounting comprising:

a respective holding device mounted to each mounting protrusion;

each holding device comprising a first respective spring-loaded support member supporting the optical element relative to the optical column, the first spring-loaded support member being configured to provide rigid support of the respective mounting protrusion in a gravity direction while providing flexible support of the respective mounting protrusion in directions tangential to the periphery at the respective location, in a radial direction of the optical element at the respective location, and in a tilt direction, relative to the axis, of the optical element at the respective location; and

each holding device also comprising at least a second respective spring-loaded support member supporting the respective mounting protrusion relative to the optical column, each second spring-loaded support member being configured to provide rigid support of the respective mounting protrusion in directions tangential to the periphery at the respective location while providing flexible support of the respective mounting protrusion in the gravity direction and in the radial direction at the respective location.

20. The mounting of claim 19, wherein each holding device further comprises a third respective spring-loaded support member supporting the respective mounting protrusion relative to the optical column, each third spring-loaded support member being configured to provide, in conjunction with the second spring-loaded support member, rigid support of the optical element in directions tangential to the periphery at the respective location while providing flexible support of the respective mounting protrusion in the gravity direction and in the radial direction at the respective location.

21. The mounting of claim 19, wherein:

each of the first and second spring-loaded support members comprises a respective two pairs of flat springs; and

each pair of flat springs comprises respective first and second flat springs serially arranged in a respective longitudinal direction in which the respective support member provides rigid support for the optical element, while being flexibly compliant in the directions in which the respective spring-loaded support member provides flexible support for the optical element.

22. The mounting of claim 21, wherein each of the respective first and second flat springs in each pair thereof comprises, in serial connection, a rigid portion flanked by the respective first and second flat springs.

23. The mounting of claim 21, wherein, with respect to each of the first and second spring-loaded support members:

each of the first and second flat springs in each pair of flat springs is configured as a respective two-dimensional flat spring; and

the first and second flat springs in each pair are perpendicular to each other in respective orthogonal directions that are mutually perpendicular to each other and to the longitudinal direction.

24. The mounting of claim 23, wherein each of the respective first and second flat springs in each pair thereof comprises, in serial connection, a rigid portion flanked by the respective first and second flat springs.

25. The mounting of claim 19, wherein:

each protrusion has a center; and

with respect to each of the second spring-loaded support members, the constituent two pairs of flat springs have a center that is aligned with the center of the respective protrusion.

26. The mounting of claim 19, comprising at least three holding devices arranged equi-angularly around the periphery of the optical element.

27. An optical-element mounting for holding an optical element relative to an optical column of an optical system that includes the optical element, the optical element having an axis, a periphery, and multiple discrete mounting protrusions extending from respective locations on the periphery, the mounting comprising:

a respective holding device comprising a respective clamping-support unit mounted to each mounting protrusion;

each clamping-support unit comprising opposing first and second contact portions situated and configured to contact respective surfaces of the respective mounting protrusion; and

each clamping-support unit being sufficiently compliant to allow tilting of the respective first and second contact portions relative to the respective surfaces of the respective mounting protrusion.

28. The mounting of claim 27, wherein, in each clamping-support unit, at least one of the respective first and second contact portions comprises at least one respective flat spring supporting the respective contact portion in the clamping-support unit, the respective flat spring providing the compliance of the respective clamping-support unit.

29. The mounting of claim 27, wherein, in each clamping-support unit, the respective first and second contact portions are configured to accommodate tilting of the optical element relative to the optical column.

30. The mounting of claim 27, wherein, in each clamping-support unit, the respective first and second contact portions are configured to accommodate rotational movement of the optical element about the axis relative to the optical column.

31. The mounting of claim 30, wherein, in each clamping-support unit, the respective first and second contact portions are configured to accommodate tilting of the optical element relative to the optical column.

32. The mounting of claim 27, further comprising a tightenable fastener associated with each clamping-support unit mounted to a respective mounting protrusion, the tightenable fastener being configured for adjustment of a clamping force with which the clamping-support unit is mounted to the respective protrusion, wherein the relative clamping force is revealed by a degree of tilt of at least one of the respective first and second contact portions.

33. The mounting of claim 27, wherein each holding device further comprises:

a first respective spring-loaded support member supporting the optical element relative to the optical column, the first spring-loaded support member being configured to provide rigid support of the respective mounting protrusion in a gravity direction while providing flexible support of the respective mounting protrusion in directions tangential to the periphery at the respective location, in a radial direction of the optical element at the respective location, and in a tilt direction, relative to the axis, of the optical element at the respective location; and

at least a second respective spring-loaded support member supporting the respective mounting protrusion relative to the optical column, each second spring-loaded support member being configured to provide rigid support of the respective mounting protrusion in directions tangential to the periphery at the respective location

while providing flexible support of the respective mounting protrusion in the gravity direction and in the radial direction at the respective location.

34. An optical system, comprising:

an optical column comprising a mounting member;

an optical element having a mounting surface; and

an optical-element mounting serving to mount the optical element to the mounting member and thus to the optical column, the mounting comprising multiple holding devices arranged at respective locations relative to the mounting surface, each holding device comprising a respective linking unit extending from a respective location on the mounting member and a respective bonding member attached to a respective bonding location on the mounting surface, each bonding member comprising a bonding pad bonded to the respective bonding location on the mounting surface, and at least first and second spring members extending from the bonding pad in respective directions to the linking unit.

35. The optical system of claim 34, further comprising at least one shape-adjustment mechanism situated relative to a respective holding device and to the mounting member, the shape-adjustment mechanism comprising an actuator configured, when energized, to move the respective holding device relative to the mounting member and thus apply a moment to a respective portion of the optical element supported by the respective holding device so as to impose or change a shape error of the optical element.

36. The optical system of claim 34, further comprising at least one position-adjustment mechanism situated relative to the mounting member and the optical column, the position-adjustment mechanism comprising (i) an actuator configured, when energized, to move and thus apply a displacement force to a respective location on the mounting member relative to the optical column, and thus to a respective

location on the optical-element mounting; and (ii) a drive-limiter mechanism serving to reduce a movement distance imparted to the respective location on the mounting member relative to a corresponding movement distance of the actuator.

37. An optical system, comprising:

an optical column comprising a mounting member;

an optical element having an axis, a periphery, and multiple discrete mounting protrusions extending from respective locations on the periphery; and

an optical-element mounting serving to mount the optical element to the mounting member, the mounting comprising (i) a respective holding device mounted to each mounting protrusion; (ii) each holding device comprising a respective first spring-loaded support member supporting the optical element relative to the mounting member, the first spring-loaded support member being configured to provide rigid support of the respective mounting protrusion in a gravity direction while providing flexible support of the optical element in directions tangential to the periphery at the respective locations, in a radial direction of the optical element at the respective location, and in a tilt direction, relative to the axis, of the optical element at the respective location; and (iii) each holding device also comprising at least a respective second spring-loaded support member supporting the optical element relative to the mounting member, each second spring-loaded support member being configured to provide rigid support of the optical element in directions tangential to the periphery at the respective location while providing flexible support of the optical element in the gravity direction and in the radial direction at the respective location.

38. The optical system of claim 37, further comprising at least one shape-adjustment mechanism situated relative to a respective holding device and to the mounting member, the shape-adjustment mechanism comprising an actuator configured, when energized, to move the respective holding device relative to the mounting member

and thus apply a moment to a respective portion of the optical element supported by the respective holding device so as to impose or change a shape error of the optical element.

39. The optical system of claim 38, wherein the shape-adjustment mechanism is configured to apply a displacement, in a direction perpendicular to the gravity direction, to at least one of the first spring-loaded support members.

40. The optical system of claim 39, wherein each of the spring-loaded support members comprises at least two respective flat springs oriented perpendicularly to each other.

41. The optical system of claim 37, further comprising at least one position-adjustment mechanism situated relative to the mounting member and the optical column, the position-adjustment mechanism comprising (i) an actuator configured, when energized, to move and thus apply a displacement force to a respective location on the mounting member relative to the optical column, and thus to a respective location on the optical-element mounting; and (ii) a drive-limiter mechanism serving to reduce a movement distance imparted to the respective location on the mounting member relative to a corresponding movement distance of the actuator.

42. An optical system, comprising:

an optical column comprising a mounting member;

an optical element having an axis, a periphery, and multiple discrete mounting protrusions extending from respective locations on the periphery; and

an optical-element mounting serving to mount the optical element to the mounting member and thus to the optical column, the mounting comprising, for each of multiple mounting protrusions, a respective holding device comprising a respective clamping-support unit mounted to each mounting protrusion, each clamping-support

unit comprising opposing first and second contact portions situated and configured to contact respective surfaces of the respective mounting protrusion; each clamping-support unit being sufficiently compliant to allow tilting of the contact portions relative to the respective surfaces of the respective mounting protrusion.

43. The optical system of claim 42, further comprising at least one shape-adjustment mechanism situated relative to a respective holding device and to the mounting member, the shape-adjustment mechanism comprising an actuator configured, when energized to move the respective holding device relative to the mounting member and thus apply a moment to a respective portion of the optical element supported by the respective holding device so as to impose or change a shape error of the optical element.

44. The optical system of claim 42, wherein each holding device further comprises at least one respective first spring-loaded support member supporting the optical element relative to the mounting member and being configured to provide rigid support of the respective mounting protrusion in a gravity direction while providing flexible support, relative to the mounting member, of the respective mounting protrusion in directions tangential to the periphery at the respective locations, in a radial direction of the optical element at the respective location, and in a tilt direction, relative to the axis, of the optical element at the respective location.

45. The optical system of claim 44, wherein each holding device further comprises at least a respective second spring-loaded support member supporting the respective mounting protrusion relative to the mounting member and being configured to provide rigid support, relative to the mounting member, of the respective mounting protrusion optical element in directions tangential to the periphery at the respective location while providing flexible support of the respective mounting protrusion in the gravity direction and in the radial direction at the respective location.

46. The optical system of claim 44, further comprising at least one shape-adjustment mechanism situated relative to a respective holding device and to the mounting member, the shape-adjustment mechanism comprising an actuator configured, when energized to move the respective holding device relative to the mounting member and thus apply a moment to a respective portion of the optical element supported by the respective holding device so as to impose or change a shape error of the optical element.

47. The optical system of claim 46, wherein the shape-adjustment mechanism is configured to apply a displacement, in a direction perpendicular to the gravity direction, to at least one of the first spring-loaded support members.

48. The optical system of claim 47, wherein each of the spring-loaded support members comprises at least two respective flat springs oriented perpendicularly to each other.

49. The optical system of claim 42, further comprising at least one position-adjustment mechanism situated relative to the mounting member and the optical column, the position-adjustment mechanism comprising (i) an actuator configured, when energized, to move and thus apply a displacement force to a respective location on the mounting member relative to the optical column, and thus to a respective location on the optical-element mounting; and (ii) a drive-limiter mechanism serving to reduce a movement distance imparted to the respective location on the mounting member relative to a corresponding movement distance of the actuator.

50. An optical system, comprising:

an optical column comprising a mounting member;

an optical element;

an optical-element mounting serving to mount the optical element to the mounting member and thus to the optical column; and

at least one shape-adjustment mechanism situated relative to the optical-element mounting and to the mounting member, the shape-adjustment mechanism comprising an actuator configured, when energized, to apply a moment to a portion of the optical element supported by the mounting so as to impose or change a shape error of the optical element.

51. The optical system of claim 50, wherein:

the optical element defines multiple mounting protrusions;

the optical-element mounting comprises, for each mounting protrusion of the optical element, at least one respective spring-loaded support member situated and configured to hold and support the respective mounting protrusion relative to the mounting member rigidly in a gravity direction and flexibly in a horizontal direction perpendicular to the gravity direction; and

the shape-adjustment mechanism comprises an actuator situated and configured to apply, when energized, a displacement in the horizontal direction to at least one spring-loaded support member.

52. The optical system of claim 51, wherein each spring-loaded support member comprises a respective pair of two-dimensional flat springs that are perpendicular to each other.

53. An optical system, comprising:

an optical column comprising a mounting member;

an optical element;

an optical-element mounting serving to mount the optical element to the mounting member and thus to the optical column; and

at least one position-adjustment mechanism situated relative to the mounting member and thus to the optical column, the position-adjustment mechanism comprising (i) an actuator configured, when energized, to move and thus apply a displacement force to a respective location on the mounting member relative to the optical column, and thus to a respective location on the optical-element mounting, and (ii) a drive-limiter mechanism serving to reduce a movement distance imparted to the respective location on the mounting member relative to a corresponding movement distance of the actuator.

54. The optical system of claim 53, wherein the drive-limiter mechanism comprises a lever connecting the actuator to the respective location on the mounting.

55. The optical system of claim 54, wherein the lever has a fulcrum connected to the optical column by a flat spring.

56. The optical system of claim 53, wherein the position-adjustment mechanism comprises a mechanism that adjusts one or more of an X-position, a Y-position, a Z-position, a θ_x-position, a θ_y-position, and a θ_z-position of the mounting member, and thus the optical element, relative to the optical column.

57. The optical system of claim 53, wherein the position-adjustment mechanism comprises X-, Y-, θ_z-adjustment mechanisms for adjusting the X-, Y-, and θz-position, respectively, of the mounting member, and thus the optical element, relative to the optical column.

58. The optical system of claim 53, wherein the position-adjustment mechanism comprises Z-, θ_x-, θ_y-adjustment mechanisms for adjusting the Z-, θ_x-, and θ_y-position, respectively, of the mounting member, and thus the optical element, relative to the optical column.

59. The optical system of claim 58, wherein the position-adjustment mechanism comprises X-, Y-, θ_z-adjustment mechanisms for adjusting the X-, Y-, and θz-position, respectively, of the mounting member, and thus the optical element, relative to the optical column.

60. The optical system of claim 59, wherein the X-, Y-, θ_z-adjustment mechanisms and the Z-, θ_x-, θ_y-adjustment mechanisms are arranged in parallel.

61. The optical system of claim 58, wherein each of the Z-, θ_x-, θ_y-adjustment mechanisms comprises a respective spring-loaded support member that supports the mounting member, and thus the optical element, in a Z-direction relative to the optical column, each spring-loaded support member supporting the mounting member rigidly in a gravity direction and flexibly in a horizontal direction perpendicular to the gravity direction.

62. The optical system of claim 61, wherein each spring-loaded support member comprises a respective two-dimensional flat spring comprising a pair of flat springs oriented perpendicularly to each other.

63. The optical system of claim 53, further comprising a position-fixing mechanism situated relative to the mounting member and the optical column and configured to fix the position of the mounting member, and thus the optical element, relative to the optical column, the position-fixing mechanism comprising at least three fixing members each comprising multiple respective flat springs collectively exhibiting a degree of freedom of motion in a respective direction, wherein the respective degree of freedom of motion of each position-fixing mechanism is different one from the other.

64. A microlithographic-exposure system for selectively irradiating an energy beam to a sensitive substrate to imprint a pattern on the substrate, the system comprising an optical system as recited in claim 34.

65. A microlithographic-exposure system for selectively irradiating an energy beam to a sensitive substrate to imprint a pattern on the substrate, the system comprising an optical system as recited in claim 37.

66. A microlithographic-exposure system for selectively irradiating an energy beam to a sensitive substrate to imprint a pattern on the substrate, the system comprising an optical system as recited in claim 42.

67. A microlithographic-exposure system for selectively irradiating an energy beam to a sensitive substrate to imprint a pattern on the substrate, the system comprising an optical system as recited in claim 50.

68. A microlithographic-exposure system for selectively irradiating an energy beam to a sensitive substrate to imprint a pattern on the substrate, the system comprising an optical system as recited in claim 53.